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## **Observations of Protoplanetary Disks with ALMA**

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Review of observations of protoplanetary disks during the period of ALMA Cycle 0-1 is presented. Even in its early science stage, ALMA has offered much better sensitivity and imaging capabilities than the previous instruments at millimeter and sub-millimeter wavelengths, bringing us many exciting results in this field. Three topics are discussed in detail in this talk: (1) Observational results on detailed structure of the disks are presented. ALMA has revealed small-scale “irregular” features inside a disk, such as radial gap and asymmetric distribution of the emission. The origin and nature of these features are still controversial, but these will be clues to better understanding of the formation processes of planets. (2) Size distribution of dust particles and its spatial non-uniformity are discussed. Small power law index ( $\approx 1$ ) for frequency dependence of dust opacity has been regarded as evidence for dust growth in a disk. Recent results related to this topic (with ALMA, CARMA, J-VLA) are reviewed, and their connection with latest theories on growth and destruction of dust particles are also presented. (3) Gas-to-dust mass ratio inside the disk is discussed. Potential mechanisms that may lead independent evolution of dust and gas inside the disk are summarized, and then ALMA results that could be interpreted by such mechanisms are presented.